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ences for the use of students who have paid less attention than myself to the subject.*

In concluding, I desire to express my thanks to several members of the Academy of Natural Sciences who have assisted and encouraged me, and especially to Dr. Jos. Leidy.

A Review of the TERNS of North America.

BY ELLIOTT COUES.

Considerable difference has prevailed among ornithological writers with regard to the relationships of many of the North American *Sterninæ* with the representative species of Europe. Having at command a very extensive series of specimens from both continents, I have instituted a careful comparison of the more or less intimately related species, believing that the results of such an investigation would not prove unacceptable to ornithologists. While this has been the principal aim of the present paper, I have endeavored to present fairly the data tending to determine some other points of synonymy and relationship which even at this late day remain open to discussion; and to give such stages of plumage as are not already too well known to require notice. The paper is not to be considered in any sense as a monograph; I have endeavored to express its character in its title.

I am under particular obligations to Mr. G. N. Lawrence and Mr. D. G. Elliot, for the opportunity of examining several unique and typical specimens, and unusual stages of plumage, of which the museum of the Smithsonian Institution does not contain examples.

Family *LARIDÆ*.

Subfamily *STERNINÆ*.

Section *STERNEÆ*.

Genus *GELOCHELIDON* Brehm.

Gelochelidon, Brehm, Vög. Deutsch. 1830. Type *S. anglica*, Mont.

Laropsis, Wagler, Isis, 1832, p. 1225. Same type.

CHAR.—Bill shorter than the head, extremely robust, not very acute; its height at base nearly a third of its total length along culmen; prominence at symphysis well marked, but not very acute, situated so far back as to make the gonys equal in length to the rami, reckoning from the termination of the feathers on the side of the mandible. Culmen very convex; gonys straight; commissure gently curved. Wings exceedingly long, and acute; each feather a full inch longer than the next. Tail rather short, contained $2\frac{1}{2}$ times in the wing; in form deeply emarginate, but its lateral feathers without the elongation of *Sterna*. Feet long and stout; tarsus a little shorter than the bill, exceeding the middle toe and claw. Hind toe well developed; inner shorter

* Several authors not mentioned in our former work may here be briefly cited.

Borellus, De Motu Animalium.

Camper, Beobachtungen der Berlinischen Gesellschaft, vol. i. 1787.

Von dem Fluge der Voegel, Schriften der Berlinischen Gesellschaft, vol. ii. 1781, p. 214.

Mayer, Das aufrecht Stehen. Mueller's Archiv, vol. xx. 1853, p. 9.

Fick, Ueber die Gestaltung der Gelenkflaechen. Mueller's Archiv, 1853, vol. xx. p. 657.

Schuebler, Bedeutung der Mathematik fuer die Naturgeschichte. Jahreshette des Vereins fuer Vaterlandskunde, Stuttgart, 1849.

Dr. J. Aiken Meigs, Relation of Atomic Heat to Crystalline Form, vol. iii. Jour. Acad. Nat. Sc. Philadelphia, 1855-58, p. 105.

Prof. Popoff, Description de la Courbe fruiforme. Bulletin de la Société des Naturalistes de Moscou, 1859, part i. p. 283.

Zeising, Ueber die Metamorphosen in den Verhaeltnissen der menschlichen Gestalt. Acta Academiæ Cesareæ Leopoldino-Carolinæ, vol. xxvii. part ii.

1862.]

than outer; interdigital membranes deeply incised, especially the inner. Tail and rump concolor with the back. Size moderate.

Gelochelidon is a well-marked generic form of the *Sterninæ*, embracing several species agreeing in their short, very robust bills, exceedingly long wings, lengthened tarsi, and short tail,—which latter never attains the deeply-forked shape of typical *Sternæ*. It differs in coloration above from most of the other genera of Terns, in having the pearl blue mantle continued over the rump and tail.

The name *Gelochelidon* was proposed by Brehm two years before Wagler instituted his genus *Laropsis*. Both are founded upon the same type,—*S. anglica*, Mont.

GELOCHELIDON ANGLICA Bp. ex Mont.

Sterna anglica, Montagu, and of authors.

Thalasseus anglicus, Boie, Isis, 1822, p. 563.

Laropsis anglica, Wagler, Isis, 1832, p. 1225.

Gelochelidon anglica, Bp. Comp. List, 1838, p. 61.

Gelochelidon palustris, Macgill., Man. Orn., 1842, ii. p. 237.

Sterna aranea, Wilson, Am. Orn. Lawrence, Gen. Rep., 1858, p. 859.

Gelochelidon aranea, Bonap., Comp. List, 1838, p. 61.

DIAG.—*Sterna* rostro breve, robustissimo, nigro; dorso cærulescente-perlaceo, uropygio caudaque concoloribus; remigibus primariis argentato-griseis, vix albo intus marginatis, nisi basin versus; corpore subtus albo, pedibus nigris.

Habitat.—Atlantic Coast of America, from Massachusetts southward. Europe.

This species differs from all the other Terns of North America, except *Sterna antillarum*, in having the rump and tail of the same color with the back. Its primaries differ from other species—though approaching nearest to *Thalasseus caspius*—in having the inner webs white for a comparatively short space; and the white is not pure, nor is there a very trenchant line of division between it and the dark portions of the feathers.

I have not a sufficient number of skins before me for a perfectly satisfactory comparison of the birds of the two continents, but, so far as I can judge, I am decidedly inclined to agree with Audubon in opinion, that no difference exists. I have minutely compared the specimens before me, and found them absolutely identical in every particular of size, form and color.

The American bird was first described by Wilson, under the name of *Sterna aranea*, that author, perhaps, considering it distinct from, but much more probably being unaware of the existence of, the European bird. It was very properly referred by subsequent American writers,—Nuttall, Audubon, and Bonaparte up to 1838,—to the latter. At that date, in his Comparative List, Bonaparte distinguishes it from the European bird under the name of *Gelochelidon aranea*, and his example has been generally followed by writers since that time.

Genus THALASSEUS Boie.

Thalasseus, Boie, Isis, 1822, 563. Type *S. caspia*, Pall.

Hydroprogne, Kaup, Sk. Ent. Eur. Thierw., 1829, 71. Same type.

Sylochelidon, Brehm, Vög. Deutsch. 1830. Same type.

Helopus, Wagler, Isis, 1832, 1224. Same type.

Actochelidon, Kaup, Sk. Ent. Eur. Thierw., 1829, 31. Type *S. cantiaa*, Gm.

CH.—Size very large, large, or moderate; general form more or less robust; a decided occipital crest. Bill as long as, or longer than, the head, robust, height at base a third to a fourth the length of culmen. Culmen variable in amount of curvature; position of the angle at symphysis variable. Wings moderately long (for this subfamily); pointed and acute; but the first primary not surpassing the second by as much as the latter surpasses the third. Tail moderate or short; in the type of the genus very short, being contained three times in the wing, and but moderately emarginate; in other species more

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elongated and more deeply forked, and contained only about twice in the wing. Feet short and stout, black; tarsi about two-thirds the bill, or rather less; as long as, or slightly longer than, the middle toe and claw. Webs moderately incised, the inner the most so. Hind toe very short.

This genus, as at present constituted, is chiefly distinguished from *Sterna* by its large size and general robust form, stout bill and feet, and (in typical species) much shorter and less forked tail. In the preceding diagnosis I have been obliged to define the genus with considerable latitude from the somewhat dissimilar types at present retained in it. Thus, if we take the *Th. caspius*, and *Th. cantiacus*, which may be considered as representing the two extremes of form, we shall find great discrepancies in such important features as shape and robustness of bill, amount of emargination of tail, &c.; and regarding these extremes alone, might well be inclined to separate them. Examination, however, of intermediate species, such as *T. regius* and *elegans*, of North America, *T. velox*, of Europe, &c., will show so gradual a transition in nearly every feature, from one extreme to the other, that it becomes exceedingly difficult to draw a line which shall naturally divide the group into two or more genera. In view of the above facts, I prefer, for the present at least, to retain the several species under a single genus, as they certainly do differ, markedly, from *Sterna* in important characteristics, although presenting the above discrepancies among themselves.

It is not impossible, however, that *T. caspius*, with one or two other very closely allied species from various parts of the world, may be, without impropriety, separated generically from the others. This species is typical of a group, all intimately allied, which are pre-eminently distinguished by their exceedingly large, high, robust bills, very stout feet, remarkably short tails,—the lateral feathers of which are scarcely at all elongated, and are not tapering nor acuminate,—and general large powerful form. The genus might, by the exclusion of this form, be greatly restricted, and much more rigidly defined.

Of the five synonyms given at the head of this article, all, with the exception of *Actocheilidon*, (the type of which is *S. cantiacus*, Gm.) are based upon *S. caspius*, Pallas. Of these *Thalasseus*, of Boie, has priority in point of date, and is the name to be adopted for the genus. Boie's genus, however, is considered to be based upon *S. caspius*, merely from the fact of that species being the first mentioned, no particular type being indicated. In the event of the separation of *S. caspius* and its intimate allies, above suggested, it might be well to apply the name *Hydroprogne* to the restricted group, *Thalasseus* being used to designate the remaining species. In view of the very slight reasons for considering *Thalasseus* as having special reference to *S. caspius*, such a procedure would be hardly, if at all, an infringement on the rules of nomenclature, and would obviate the necessity of presenting *regia*, *elegans* and their congeners under a generic designation not before employed,—viz.: *Actocheilidon*.

THALASSEUS CASPIUS Boie ex Pall.

Sterna tschegrava, Lepechin, Nov. Com. Pet. xiv. p. 500.

Sterna caspia, Pallas, Nov. Com. Pet. xiv. p. 582. Lawrence, Gen. Rep. Birds, 1838, p. 859, and of most authors.

Thalasseus caspius, Boie, Isis, 1822, p. 563.

Hydroprogne caspia, Kaup, Sk. Ent. Eur. Thierw., 1829, p. 91.

Helopus caspius, Wagler, Isis, 1832, p. 1224.

Sylocheilidon caspia, Brehm, Bonaparte, Comp. List, 1838. Lawrence, Proc. N. Y. Lyc. Nat. Hist., 1850, v. 37.

Sterna megarhynchos, Meyer, Taschenb. Deuts., ii. p. 457.

DIAG.—T. rostro maximo, robustissimo, rubro; palpebris inferioribus albis; remigibus griseo-fuscis, suprâ argentatis, nec intus albis; caudâ brevior, emarginatâ; pedibus validissimis, nigris, digito medio cum ungue tarso brevior.

1862.]

Habitat.—In America, the interior of the Fur Countries; Hudson's Bay; Labrador; in winter ranging southward along the Atlantic Coast as far as New Jersey.

This species in all its stages of plumage is too well known to require any further description.

Quite a large series of American skins, of all ages, compared with two fully adult birds from Europe, constantly differ in size and proportion, as shown by the following measurements:

Comparative measurements of American and European Birds.

	American.	European.
Length of bill along culmen.....	2.75*	2.40
“ “ “ gape.....	4.00	3.55
Height “ at base.....	0.90	0.75
Width “ opposite nostrils.....	0.50	0.50
Length of wing from flexure.....	16.50	15.00
“ “ tarsus.....	1.75	1.65
“ “ middle toe and claw.....	1.65	1.55
“ “ tail.....	5.75	5.25

The above measurements indicate the average of the specimens from both countries before me, from which it will be seen that the American bird is decidedly the larger. While the bill is nearly a third of an inch longer, it is also especially remarkable for its great comparative height at the base, and its width at base being no greater than in the European bird, gives it quite a different shape. The next most patent difference lies in the length of wing from the flexure, in which the American bird surpasses the European by fully $1\frac{1}{2}$ inches. Specimens of both, of course, differ among themselves to a degree; but the greatest variation in adult American skins is hardly half an inch. The wing of the adult European bird, indeed, hardly equals that of a young bird of the year from America; and it is well known how much smaller are the young of all Terns than the adults. The tarsi and toes of the two, as well as the tail, differ in a considerable degree, but not so markedly as do the bill and wings. I find no differences whatever in the color of the two birds.

With but two specimens of the European bird before me, I do not venture to formally separate from it its North American representative. But should these examples prove to represent fairly the characters of the European bird, and the discrepancies in size and proportion above pointed out prove constant, I should not hesitate to do so. In that event I would propose for our bird—in the absence of any very peculiar characters on which to base a name, and in view of the fact that it is the largest and most magnificent Tern of our continent—the name of *THALASSEUS IMPERATOR*.

The following would be its diagnosis:

Th. Thalasseo caspio coloribus similis; sed omnino major, rostro etiam validiore, longiore, altiore nec latiore. Rostr. long. 2.75 poll.; alæ 16.50.

The proper specific appellation of the Caspian Tern is not "*caspia* Pallas," but "*tschegrava* Lepechin," which latter name is proposed in the same work in which Pallas calls the bird "*caspia*," but has priority by several pages. As, however, the word is not only barbarous, but also exceedingly cacophonous, and especially as *caspia* has become so well established by common consent, I do not think it would be expedient to supersede Pallas' name, in view of the very slight priority of that of Lepechin.

THALASSEUS REGIUS Gambel.

Sterna cayana, Bon., 1828; Nutt., 1834; Aud., 1839 and 1844; but not of Latham.

* Inches and hundredths.

Sterna regia, Gambel, Pr. A. N. S. Ph. iv. 1848, 128.

Thalasseus regius, Id. J. A. N. S. Ph. i. 2d ser. 1849, 228.

DIAG.—Thal. rostro magno, robusto, nec peracuto, aurantio-rubro; remige primâ internè albâ nec ad apicem extensâ marginatâ; pedibus nigris, medio digito cum ungue non tarso brevior. Long. rost. 2·60 poll.; alæ 14·50; tarsi 1·30.

Habitat.—South Atlantic Coast of America; Antilles in winter. California.

A good series of this bird, collected in Jamaica, enables me to give its winter plumage, as well as that of the young of the year.

Winter Plumage.—Bill less brightly colored than in summer, its tip and cutting edges dull yellowish. Front white, crown variegated with black and white, the former color increasing on the occiput and nuchal crest, which latter, though shorter than in summer, is almost or quite unmixed with white. This black extends forwards on the sides of the head to the eye, which it includes. The tail is not pure white, as in summer, but is glossed over with the bluish of the mantle, which deepens towards the tips of the feathers into dusky plumbeous. Otherwise as in summer.

Young of the Year in August.—Bill considerably smaller and shorter than in the adult; its tip less acute, and its angles and ridges less sharply defined; mostly reddish-yellow, but light yellowish at tip. Crown much as in the adults in winter; but the occipital crest scarcely recognizable as such. Upper parts mostly white; but the pearl-gray of the adults appearing in irregular patches, and the whole back marked with small, irregularly-shaped, but well-defined spots of brown. On the tertials the brown occupies nearly the whole of each feather, a narrow edge only remaining white. Lesser wing coverts dusky plumbeous. Primaries much as in the adults, but the line of demarcation of the black and white wanting sharpness of definition. Tail basally white, but soon becoming plumbeous, then decidedly brownish, the extreme tips of the feathers again markedly white. Otherwise as in the adults.

The species is so distinct from any other of North America, that it hardly requires comparison. *Caspus* is most closely allied (except *elegans*) and has been confounded with it. But the differences between the two are very great. *Regius* is a much smaller bird, its wing two inches or more shorter. The bill is nearly or quite as long, but it is much slenderer and every way weaker. The tail is very decidedly longer and more forked, almost equalling in this respect *elegans* or *acutirostris*. The feet, with the same relative proportions of tarsus and toes, are proportionally shorter. In color the two are quite similar, except in the primaries where a very marked difference is observable. The inner webs of *caspus* are wholly dull hoary plumbeous ash; while the inner web of *regius* has a very sharply defined white margin, as in *elegans* or *acutirostris*, and *Sternæ* generally.

But while there is thus no difficulty in separating it from its North American allies, the case is quite different from the Central and South American species, with which it is more or less intimately related. It was, up to 1848, confounded with *S. cayana*, Lath. (*S. cayanensis*, Gm.) This error was first corrected by Gambel (l. c.), and a distinct name imposed. It is difficult, perhaps impossible, to determine to what species Latham's name is to be referred. His brief diagnosis is "St. griseâ, pennis rufo-marginatis, occipite nigro, corpore subtus albo. Habitat in Cayana. 16 pollices longa." This description is evidently that of a young bird. Gambel is inclined to consider it as "the immature plumage of one of the yellow-billed species of the Brazilian coast, figured by Lichtenstein, probably *S. magnirostris*." He further remarks that "young birds of our species would agree pretty well with the *erythrorhyncha*, of De Weid, as they are somewhat smaller and less proportioned."

There is a specimen in the Smithsonian collection, presented by Mr. Sclater, from Jamaica. It was killed March 23d, and is in moult; probably, a young bird putting on its first spring livery, though still retaining its winter marks of 1862.]

white front, etc. At first sight it was referred to *T. regius*, but on closer examination several important discrepancies were observed. The bill, though just about as long as in *regius*, was very decidedly smaller, weaker, with the angle at symphysis less developed; it was of a clear straw-yellow, and in size and shape about intermediate between *regius* and *elegans*. The lateral tail feathers appear broader and rounded at their tip, instead of tapering and attenuated. An important difference is seen in the feet, the middle toe and claw being decidedly longer than the tarsus, instead of equal to it. Mr. Sclater did not label this bird, and I am equally uncertain what name to apply. It seems to be not at all improbable that it may be the *S. cayana*, of Latham, and, if so, would substantiate Gambel's position, for it is certainly not the bird he named *regia*.

THALASSEUS ELEGANS Gamb.

Sterna elegans, Gambel, Pr. A. N. S. Ph. iv. 1848, 129. Lawrence, Gen. Rep. Birds, 1858, 860. Atlas, pl. xciv.

Thalasseus elegans, Gambel, J. A. N. S. Ph. 2d ser. i. 1849, 228.

DIAG.—*Th. Thalasseo regio similis*; sed multo minor, rostro graciliore, digito medio cum ungue tarso brevior; corpore subtus rosaceo-albo.

Habitat.—Coast of California.

The most striking morphological character of this species, as compared with its nearest ally, *T. regia*, is the comparative length of the tarsus and toes. In *regia* the middle toe is, with the claw, just as long as the tarsus; while the same parts in *elegans* are very considerably shorter.

This beautiful species has been so accurately described by its discoverer, and its affinities so correctly indicated, that any further remarks upon these points would be *de trop*. It is as yet almost unknown in cabinets. A very fine specimen, in winter plumage, has been deposited in the Smithsonian by J. Hepburn, Esq., and is the original of the plate above cited. It agrees minutely with Gambel's description.

THALASSEUS ACUFLAVIDUS (Cabot).

Sterna Boysii, Nuttall, Man. Orn. ii. 1834, 276. Sed non Lath., 1790.

Sterna cantiaca, Audubon, Orn. Biog. iii. 1835, 531. Id. B. A. vii. 1844, 87. Sed non Gmel., 1788.

Sterna acuflavida, Cabot, Proc. Bost. Soc. N. H., 1837, ii. 257. Lawr. Gen. Rep. 1858, 860.

Thalasseus acuflavidus, ——— ?

DIAG.—*T. Thalasseo cantiaco staturâ, formâ, coloribusque omnino similis*; sed margine albâ pogonii interni remigis primæ angustiore, nec in apicem pennæ porrectâ.

Habitat.—Atlantic Coast of North America, ranging into the Antilles in winter.

The young of the year is considerably smaller than the adult (wing $\frac{1}{2}$ inch shorter) as is usual in this subfamily. The bill is shorter and weaker, and is without any very distinct definition of angles and ridges. It is brownish black, the extreme point only yellowish. The crown, front and nape are brownish black, variegated with white, the white touches very small on the front. The upper parts are as in the adults; but everywhere marked with irregularly-shaped, but well-defined spots and transverse bars of decided brownish black. There is no well formed occipital crest, until after the first moult. The primaries are like those of the adults. The tail, however, is very different. The feathers for three-fourths their length are of the color of the back; this color gradually deepens, until towards the tips it becomes brownish black,—each feather having a terminal irregular edge left whitish. The tail, in shape, is simply deeply emarginate, the outer feathers being but slightly longer than the second.

In winter the yellow tip of the bill of the adults decreases in extent and intensity of color; the front is white, either pure or speckled with black; the crown variegated with black and white; but the long occipital crest, which does

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not disappear at this season, remains of an unmixed brownish black. The lateral tail feathers are shorter. The bird otherwise as in summer.

At all seasons the yellow tip of the bill varies in extent, and it also presents a varying regularity and sharpness of division from the black. I am inclined to think that the extent of the yellow depends upon the age of the bird: its intensity upon the season. The longest yellow tip before me measures three-fourths of an inch, the shortest one-fourth. In a large series of specimens the tarsi and toes scarcely differ appreciably. The markings of the primaries, in their extent and disposition, are also remarkably constant. The variation in length of wing from flexure in adult summer birds is about half an inch. The tail varies somewhat in depth of fork, but is always less than in the species of *Sterna proper*.

A series of winter skins from Jamaica in, probably, their first moult, differ from adult examples from various points on the Atlantic Coast in being every way considerably smaller. The bills are about a third of an inch shorter than the average; and other parts differ proportionally.

The American Sandwich Tern was first separated from the European by Cabot, (l. c.) in 1847. Most of the points of difference, however, assigned by that writer, disappear when large series from both continents are compared. The difference in the measurements given exists equally in individuals of both species; for, as will be seen from the above remarks, specimens vary greatly in these respects. After an attentive examination of a large number of skins, I can appreciate no differences whatever in these respects; and in size and proportions, of bill as well as of the whole body, the two appear identical. Neither can distinctive characters be drawn from the yellow tip of the bill. In both species the line of union of the yellow and black is equally irregular, depending for its exact character on the age of the bird. In both, the yellow runs along the gonys, nearly or quite to the angle at the symphysis. It also extends, but in a less degree, along the ridge of the upper mandible, and even for a little way on the cutting edges of both mandibles. The outline of the yellow on the sides of the bill is also more usually concavo-convex than perfectly straight and perpendicular. The trenchant line of union, which existed in the specimen described by Cabot, must have been rather exceptional. I cannot appreciate any difference in the width of the bills of the two in the series before me. A discrepancy in the claws of the two does not exist as constant.

We are reduced, therefore, in separating the two birds, to the single remaining character given by Cabot,—that of the primaries. These parts in the American bird are not darker than those of the European, since their color depends on their age; but a decided difference in the white margins of the inner webs exists uniformly in all the specimens from either country that I have ever examined. In the European bird the white of the inner web of the first primary occupies at the base nearly the whole of the web, the dark portion being merely a narrow line along the shaft. This black portion widens but little as it runs along the feather, so that the white border extends quite broadly to the very tip of the feather, which it entirely occupies. In the American, on the contrary, the black portion is in its whole length wider, and, about one and a half inches from the tip becomes quite suddenly very decidedly broader, so much so as nearly to cut off the white, which latter continues forward a little further, but only as a very narrow bordering line, and finally disappears before it reaches the tip. The same holds good, though somewhat less markedly, of the second, third and fourth primaries. The following would therefore constitute the

Differential diagnoses of the American and European Bird.

Th. cantianus.—White margins of inner web of outer three or four primaries wide, extending quite to tip, which it wholly occupies. Breadth of white portion $1\frac{1}{2}$ inches from tip of first primary, .25 of inch.

1862.]

Th. acutiflavus.—White margins of inner web of three or four outer primaries narrow, falling short of tip, which is wholly occupied by the black portion. Breadth of white margin $1\frac{1}{2}$ inches from tip of first primary, .10 of an inch.

Genus STERNA Linnæus.

Sterna, Linn., Syst. Nat. 1748. Type, *S. hirundo*, Linn.

Thalassea, Kaup, Sk. Ent. Eur. Theirw. 1829, p. 97. Type, *S. paradisea*, Brün.

Hydrocecropis, Boie, Isis, 1844, p. 178. Type, — ? (includes *S. paradisea*.)

Sternula, Boie, Isis, 1822, 563. Type, *S. minuta*, Linn.

CH.—Head without a decided occipital crest, but the feathers of the parts somewhat elongated; size moderate, or very small; general form slender and graceful. Bill about as long as, or slightly shorter than, the head, greatly exceeding the tarsus; of varying stoutness, but usually quite slender, very acute, the culmen gently curved, being slightly declinato-convex. Commissure gently curved; outline of rami a little concave, of gonyes quite straight, the angle at symphysis well marked and acute, but not very prominent. Wings long and pointed. Tail of variable length and amount of forking, but always decidedly greatly forked; the lateral feathers elongated, slender and tapering, greatly surpassing the others. Tail contained in the wing of the type of the genus about $1\frac{1}{2}$ times; in *arctica* $1\frac{1}{2}$ times; while the tail of *paradisea* is but little less than the wing. Tarsus slender, slightly shorter than the middle toe and claw, slightly longer than the middle toe alone; much shorter than the bill, about equal to the distance between the projection at symphysis and the tip of the inferior mandible.

The genus *Sterna*, in the restricted acceptance in which it is employed by most modern authors, embraces quite numerous species, all more or less intimately related to *S. hirundo*. The group is one well defined, its species agreeing very closely in size, general form, pattern of coloration, and seasonal changes of plumage. Specific characters are generally found in the varying length and stoutness of bills and tarsi, amount of forking of the tail, markings of the primaries, and other less decided features of coloration.

Sterna proper has comparatively few synonyms, the principal of which are those given at the head of this article. *Thalassea*, Kaup, and *Hydrocecropis*, Boie, are strictly synonymous, while *Sternula*, Boie, is based upon a species differing but very slightly from the type, *S. hirundo*.

"STERNA TRUDEAUI Aud."

Sterna Trudeaui, Audubon, Orn. Biog. v. 1839, 125. Lawr. Gen. Rep. Birds, 1858, 861.

I have before me a typical specimen of *Sterna Trudeaui*, belonging to J. P. Giraud, Jr., the one from which was drawn up the description in the General Report, and supposed to be also the original of Audubon's plate and description. As these are the chief descriptions of the bird which have ever appeared, and as, I believe, the specimen is the only one known to exist, it may fairly be considered to embody all that is at present known of the species. From the peculiar characters presented by it, as well as by the species which succeeds, —to both of which attach, for various obvious reasons, doubts as to validity, —it may be of advantage to examine somewhat closely into its characters, to determine if possible whether they be distinct from each other; and in that case in what they differ from *S. Forsteri*.

The bill is quite stout at the base, both as regards height and width, and tapers regularly to an acute point, the culmen being but slightly arcuate. It is precisely the length of that of an adult *Forsteri*, and also of a supposed *Havelli*.*

* The specimens of "*Havelli*" referred to, are those furnished by Mr. Lawrence, and so labelled by him.

It is bright yellow at the tip for exactly the same distance as is the bill of "*Havelli*;" but the base, for nearly a third of the length of the bill, appears to have been in life bright orange yellow, so that only the middle of the bill is left black; whereas, in "*Havelli*," the bill is black from its yellow tip quite to the base of the upper mandible, and only a small space on the under mandible is left yellow. The front and crown are white, passing into light pearl blue on the nape, exactly as in "*Havelli*;" the circumocular fascia also exists, but it is somewhat narrower than in that species. The other upper parts are of exactly the shade of *Forsteri* or "*Havelli*;" but this color extends around the sides of the neck quite to the throat, and occupies the whole under parts of the bird, not even excepting the under tail-coverts, whereas in "*Havelli*" and *Forsteri*, the color of the same parts is nearly or quite pure white. The rump is white, as in both those species. The tail is elongated;—exactly intermediate between a full plumaged summer *Forsteri* and "*Havelli*;" it has precisely the color of the latter, the inner web of the lateral feather being somewhat lighter than in the former. The wings, in their markings and length, are identical with those of either *Forsteri* or "*Havelli*;" the tarsi and toes are fractionally of the same length, and appear of about the same color in the dried skin.

The differences therefore between "*Havelli*" and "*Trudeaui*," lie entirely in the following features: 1st. The bases of both mandibles are orange yellow for nearly half their length in "*Trudeaui*," while in "*Havelli*" a very small portion of the under mandible only is light colored. 2d. The color of the back extends undiluted over the whole under parts of "*Trudeaui*," while the same parts in "*Havelli*" are white.

The greater slenderness of the bill, and the shorter tarsi, given by Audubon as characteristic of "*Trudeaui*," in comparison with "*Havelli*," do not exist, provided the specimens before me exhibit the characters of the latter. Indeed, a comparison of fourteen specimens of *Forsteri*, three of "*Havelli*," and the single "*Trudeaui*," shows the three to be surprisingly similar in every detail of size and proportions; the bills and tarsi particularly, hardly differing as much in length as do these parts in different individuals of *hirundo* or *macroura*.

Should the color of the bill and of the under parts of "*Trudeaui*,"—more particularly the latter—prove constant, they would be abundantly sufficient to separate it from any other species. The only question is, whether the specimen under consideration is not in an entirely accidental and abnormal state of plumage, to be placed in the same category with albinism, melanism, &c. Although Audubon states that he saw other individuals like the present specimen, it appears to be the only one ever actually examined. The question is one of great interest, but one of which, unfortunately, we are no nearer the positive solution than we were twenty years ago; and I am therefore obliged

rem in medio relinquere.

"*STERNA HAVELLI* Aud."

Sterna Havelli, Audubon, Orn. Biog. v. 1839, 122. Lawrence, Gen. Rep. Birds, 1858, 861.

So accurate a description of the winter plumage—the only one known—of this supposed species has been given by its discoverer, that it is unnecessary here to repeat it. A discussion of the essential characters assigned to it, to discover exactly what are its claims to specific distinction, may be given.

It is not a little singular that, of a species recognized for more than twenty years, the nuptial plumage should be still quite unknown. I am not aware that a specimen which could be referred to this species has ever been taken in spring or summer. There can be no doubt, however, that at that season it obtains the black pileum common to all the species of the genus,—with, probably, not even the exception of "*Trudeaui*." A specimen before me, which agrees more closely than any other with Audubon's plate and description, has the crown and occiput very noticeably variegated with black; this color, indeed,

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being almost unmixed with white on the extreme nape. The front alone is white. The character, therefore, of a black ocular fascia, and white crown, cannot be considered as diagnostic of the adult full-plumaged bird.

The chief, and, indeed, the only point to be examined, is the relationship of this species with the *S. Forsteri*,—winter specimens of which agree very closely with it. In discussing this question, it must be borne in mind that Audubon was entirely unacquainted with *S. Forsteri*, or at least did not recognize its claims to specific validity, as distinct from *S. hirundo*. Indeed, if we compare Audubon's description of his "*Havelli*" with a winter specimen of *S. Forsteri* it will be found that they correspond minutely in every particular of size, form and colors; and the characters given apply as well to the one as to the other. For, though summer specimens of *Forsteri* are quite different in the elongation of the tail, color of bill, black pileum, &c., yet in winter these features are quite changed, the tail becoming shortened, the bill blackened, and the pileum restricted to a circumocular fascia. Basing an argument, therefore, upon these data, "*S. Havelli*, Aud.," might, without the slightest impropriety, be reckoned as a synonym of *S. Forsteri*.

Three Terns, obligingly furnished for examination by Mr. Lawrence, and labelled by him "*Havelli*," differ in some respect from any winter skins of *Forsteri* which have as yet fallen under my observation. Their size and proportions, length of tarsi, elongation of tail, &c., are quite identical. The most perfect of these,—evidently an adult bird in full winter plumage,—has a stout bill, almost black, its tip for more than a fourth of an inch bright yellow. The bill in fact looks something like that of *Thalasseus cantianus* or *acutirostris*. There is a well-defined lateral stripe on the head; the whole crown is pure white, and even on the nape there are no traces of black, that part being light pearl color, much as the back. But the most distinctive feature of this specimen is that the tail is entirely very light pearl, the inner web of the lateral feather being scarcely, if at all, darker than the outer. A second specimen, a younger bird apparently, and evidently, from the ragged dull brown condition of its primaries, in moult, has the same decided character of tail as has the first one. The bill is even stouter at the base, and the extreme point only is slightly yellowish. The whole crown is variegated with black and white, the former being left nearly pure on the nape. The third specimen is quite like the last, but the inner web of the lateral feather is quite decidedly dusky, showing an approach to *S. Forsteri*. It will be noticed that where these three specimens are quite identical with each other, in size and proportions, they differ among themselves in colors, both of bill and feathers, and show quite a gradation towards *S. Forsteri*.

From the above remarks it will be seen that the question really hinges upon the following point, as yet not positively determined: Does the *S. Forsteri* in winter, when fully adult, ever acquire a very broad bright yellow tip to its otherwise wholly black bill, and lose entirely the dark character of the inner web of its exterior tail feather?

Now it is well known, that the younger a Forster's Tern is, the darker is the inner web of the lateral feather; and the natural inference from this fact is, that with increasing age the inner web may become nearly or even quite as light as the outer. With regard to the broad yellow tip of the bill, it will be noticed, that of the three specimens purporting to be "*S. Havelli*," each one varies in this particular; so that it would be quite impossible to consider it as diagnostic. Therefore, though unable to prove the point incontrovertably, I am decidedly of opinion that *Sterna* "*Havelli*," is merely the adult winter plumage of *S. Forsteri*, and not a distinct species.

STERNA FORSTERI Nuttall.

Sterna hirundo, Sw. et Rich., F. B. A., 1831, ii. 412, nec Linn.

Sterna Forsteri, Nuttall, Man. Orn., 1834, ii. p. 274 (in note to *S. hirundo*), and of authors.

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DIAG.—*S. Sternæ hirundini* similis; sed rostro longiore, valdè robustiore, tarsis longioribus, validioribus; caudâ magis productâ, perlacæâ, rectrice laterali pogonio interno fusco-griseo, externo albo.

Habitat.—Very extensively distributed over North America. Atlantic Coast and Gulf of Mexico. Fur countries. Great Lakes and Rivers. Texas. Utah. California.

In view of the considerations presented in the two preceding articles, it may be well to look somewhat carefully into the characters of the present species.

Adult, spring plumage.—Bill orange-yellow, black for nearly its terminal half, the extreme points of both mandibles yellowish; robust, deep at the base; culmen markedly declinato-convex, eminence at symphysis well developed; in total length from one to two-tenths of an inch longer than in *S. hirundo*. The black pileum does not extend so far down on the sides of the head as it does in *hirundo*, barely embracing the eye (the lower lid of which is white), and leaving a considerably wider white space between the eye and commissural edge of superior maxilla than in *hirundo*. The color of the back hardly differs appreciably from that species; it is perhaps a shade lighter. The wings are comparatively considerably shorter than in *hirundo*, being absolutely a little less, though *Forsteri* is a larger bird. They are very light colored, being strongly silvered with the peculiar hoariness common to most of the species of the genus; this lighter color is very observable even on the coverts. The outer web of the first primary is not black, but silvery like the others; all the primaries want the very decided white space on the inner webs which exists in *hirundo* and *macroura*; there are indications of it, indeed, on the three or four outer primaries, but the others are a nearly uniform dusky-gray, moderately hoary. The entire under parts are white, with scarcely a trace of the plumbeous which is so evident in *hirundo*, and amounts to so decided a color in *macroura*. The tail is a slightly lighter shade of the color of the mantle, separated from the latter for a short space by the decidedly white rump. The lateral feathers are much more lengthened than in *hirundo*, the elongation generally quite equalling that of *macroura*, and sometimes even exceeding it. These two lateral feathers are white on the outer web, dusky-gray on the inner. This being exactly the reverse of *hirundo*, and a very noticeable feature, was the first to draw attention to the bird, and this character being so tangible and convenient, writers have perhaps laid too much stress upon it, to the exclusion of others, quite as evident and more important. The feet are bright orange, tinged with vermillion; the tarsus shorter than the middle toe and claw; the feet longer and stouter, by over .10 of an inch, than the same parts in *hirundo*.

When the primaries become old, *i e.*, at the approach of the spring or autumn moult, before the species begins to put on its complete summer or winter livery, the primaries lose their beautiful silvery, and become plain brown, their shafts inclining to decided yellow. They have then also distinct white spaces on their inner webs, nearly as well marked as in *hirundo* or *macroura*.

Adult, winter plumage.—The bill loses the bright orange-yellow which exists in summer, the black encroaching upon it, so that it becomes almost wholly dusky. The base of the under mandible in dried skins appears as if it might have been flesh-colored in life. The feet also lose their bright color, and incline to a dusky-yellowish. The black pileum is more or less mixed with white, the white predominating on the forehead so as to leave it nearly pure; there is always considerable black left on the nape, and also a broad band on the side of the head, embracing the eye, and reaching to the nape behind, exactly as represented in Audubon's plate of *S. Havelii*. The long lateral tail feathers become greatly shortened, so as to be but scarcely, if at all, longer than those of *hirundo* during the breeding season. The color of the inner webs becomes darker, though it does not extend so far towards the base of the feather; sometimes it invades the outer web also, towards the tip.

Young of the year, before the first moult.—Bill every way considerably smaller,
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shorter and weaker than that of the adult, and wanting its very acute tip, and sharply-defined ridges and angles; brownish-black, fading into dull flesh-color at the base of the under mandible. Front white, but the crown and nape show considerable traces of the black that is to appear, which is now mixed with a good deal of light-brown. The pearl-blue of the back and wing coverts is everywhere interrupted by irregular patches of light grayish-brown, showing a tendency to become transverse bars; this grayish-brown on the tertials deepens into brownish-black, and occupies nearly the whole extent of each feather. The primaries differ from those of the adult in having less of the silvery gloss, and the inner white spaces are more marked, being in fact much like those of the adult *hirundo*. The rump and under parts are pure white. The tail intensifies, so to speak, its adult characters as regards color; and, independently of any other feature, will always serve to identify the species. It is deeply emarginate, but the lateral feather is not greatly produced, surpassing the second by scarcely more than the latter surpasses the third. Its inner web for an inch or so from the tip, and both webs of the other feathers, are quite decidedly grayish-black; the intensity of this color, and also its extent, decreasing successively on each feather from without inwards, so that the central pair scarcely deepen their color at the tips. The outer web of the lateral feather generally stays pretty uninterruptedly white, but sometimes is just at the tip invaded by the darker color of its inner web.

The preceding descriptions embrace all the well characterized stages of plumage of this species which are known to me, though there are, of course, intermediates in great variety between those given. It is indeed a little remarkable, the number of specimens in immature or winter plumage which find their way into collections. Of the numerous examples before me, just one-half are in this state, all showing white fronts, and the usual deep black band through the eye. There would seem to be something peculiar in the habitat of this species, to cause it to differ so remarkably from its allies *hirundo* and *macroura* in this respect. I have purposely gone considerably into detail regarding these immature stages, because of the great similarity which exists between the species, and the same ages of "*S. Havelli*," if, indeed, the latter be really distinct from it. The question of the relationship of the two has been fully discussed under the head of "*S. Havelli*."

Sterna Forsteri affords a good illustration of a species, bearing so intimate a general resemblance to another, as to be confounded with it at first glance, and yet when carefully examined proving to be totally distinct. It is perfectly easy to separate it from the *hirundo* by its characters of bill, wings, tail or feet, either of which taken alone would identify it. The following table will exhibit at a glance the distinctive features of our three most intimately allied species, between which, it will be observed, there is a complete and gradual transition in almost every respect.

Differential Diagnoses of S. Forsteri, hirundo and macroura.

S. Forsteri.—Bill (average) 1.60 along culmen; depth at base .40; robust. Bill orange-yellow, nearly its terminal half black. White space between eye and cutting edge of upper mandible broad. Under parts white. Outer web of first primary silvery; the inner webs also of the others strongly hoary, without well-defined white spaces. Tail bluish-pearl, like the back, its lateral feather greatly produced (average nearly 7 inches in length); its outer web white, inner the color of the rest of the tail. Legs long and stout; length of tarsus (average) rather over .90 of an inch; orange-yellow, tinged with vermilion. Length of tarsus, middle toe and claw 2 inches.

S. hirundo.—Bill (average) 1.45 along culmen; depth at base .33; moderate. Bill vermilion-red; its terminal third black. White space between eye and cutting edge of upper mandible narrower than in *Forsteri*. Under parts lightly washed with plumbeous, fading into white on the throat and abdomen. Outer

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web of first primary black; inner webs of the others somewhat hoary, with well defined white spaces. Tail white, different from the back, its lateral feather moderately produced (average 6 inches in length); its outer web grayish-dusky, inner white. Legs moderate; length of tarsus about .80 of an inch; light vermilion-red. Length of tarsus, middle toe and claw 1.75 inches.

S. macroura.—Bill (average) 1.30 along culmen; depth at base .30; slender. Bill wholly deep carmine-red. White space between eye and cutting edge of upper mandible narrower than in *hirundo*. Under parts decidedly plumbeous, extending from vent to throat, both of which become abruptly white. Primaries as in *hirundo*. Tail with the elongation of *Forsteri*, or rather exceeding it (average 7.50 inches), and the color of *hirundo*. Legs very short and slender; length of tarsus (average) .65 of an inch; deep vermilion, almost lake. Length of tarsus, middle toe and claw, about 1.50 inches.

Comparison of the young of the year of S. Forsteri and hirundo.—The bill and feet constantly present differences proportional to those which exist in the adults, as regards length and stoutness. The bill of *hirundo* is more decidedly yellowish at the base of the lower mandible than in that of *Forsteri*; and the feet are clear yellow instead of being tinged with dusky. The mottled and variegated crown and upper parts are much the same in both; and the markings of the quills quite identical. The tail, however, differs remarkably. In *hirundo* the outer webs of all the feathers are dusky-gray. In *Forsteri* the reverse is the case. The difference is even more marked than in the adults.

There is little to be said with regard to the bibliography of this species. In 1831 Swainson and Richardson describe it, calling it *S. hirundo*, but noticing the discrepancies which exist in the tail and feet. In 1834, Nuttall seizes upon these differences in a note under *S. hirundo*, and suggests for the species the name of *S. Forsteri*, in the event of its proving distinct. The citation "*S. hirundo*, Rich., nec Linn.," is, I believe, the only synonym of this well-marked species, unless, indeed, it be necessary to refer to it the two preceding species.

I append the detailed measurements of several specimens of this species, which will serve to show within what limits it varies in size and proportions.

Cat. No.	Locality.	Sex.	Wing.	Tail length.	Depth of fork.	Bill length.	Height at base.	Tarsus.	Middle toe and claw.
24274	New Jersey.	♂	10.00	6.90	4.00	1.65	0.40	0.94	1.15
12692	" "	×	9.50	7.70	5.00	1.58	0.40	0.91	1.10
11624	" "	×	10.10	6.75	3.60	1.64	0.40	0.90	1.15
4928	Florida.	♀	10.30	5.00	2.30	1.50	0.35	0.95	1.14
.....	"	×	9.75	7.00	4.10	1.60	0.40	0.95	1.05
9973	Sac Valley.	♂	9.70	6.90	4.00	1.56	0.40	0.90	1.10
13473	Utah.	♂	9.70	7.70	4.70	1.56	0.40	0.93	1.08
.....	California.	×	10.30	7.20	3.70	1.55	0.38	0.99	1.15
4317	Louisiana.	×	10.20	6.60	3.55	1.54	0.35	0.90	1.08

STERNA HIRUNDO Linn.

Hirundo marina, Ray, Syn., p. 131.

Sterna major, Brisson, Ornithologie, p. 113.

Sterna hirundo, Linnæus, Syst. Nat., i. 1766, 227; et auct. Fab. Fabric. et Rich. exceptis.

Hydrocecropis hirundo, Boie, Isis, 1844, p. 179.

?*Sterna fluviatilis*, Naumann, Isis, 1820, fide Temm.

Sterna marina, Eyton, Cat. Brit. Birds, 1836, p. 55.

Sterna Wilsoni, Bonaparte, Comp. List., 1838, p. 61, et auct. Amer. recent. = *S. hirundo ex America*.

"Great or Common Tern," Latham and English authors. "Hirondelle-de-1862.]

mere pierre-garin," Buffon and French authors. "Gemeine, oder Rothfüssiger Meerschwalbe," Bechstein, Meyer and German authors. "Wilson's Tern," Bonaparte, and most later American authors.

Habitat.—Sea Coasts of Europe, part of Asia and America, ascending rivers and bays to a considerable distance.

This species has been so long known that any description of its characters, or changes of plumage are unnecessary. Temminck says that the adults in winter do not lose the black of the crown, "elle est seulement plus terne." If this be so, the species forms an exception to the general rule among Terns, that at this season the front becomes nearly white, the crown variegated with black and white, or the black still further reduced to a circumocular fascia.

Comparisons of this species with *S. Forsteri* and *macroura*, its most intimate allies, will be found under the head of the former.

The common Terns of Europe and America were considered identical by all writers up to the year 1838. At that date they were separated by Bonaparte; and American authors, with the exception of Audubon, have generally followed his example. I am little pleased to be obliged to refer to a European species, an American bird which has been judged distinct by high authority, but such a procedure seems unavoidable in the present instance. I am not aware that any distinctive characters have ever been assigned to our bird. Bonaparte, in instituting the species, gives no description, as, indeed, is the case with several other species founded in the same work, with regard to which he appears to have relied, for means of separating them from their European allies, rather upon some theory of geographical distribution, than upon any discrepancies presented by the birds themselves. I have very carefully compared a series of skins from both continents, and neither in size, form or color, have I been able to detect the slightest differences; and consequently, until some one is more fortunate than myself in detecting valid specific characters, I must refer the American bird to the old Linnæan *S. hirundo*.

Below are offered the detailed measurements of five American and European birds, taken at random from a large series. It will be observed that in no respect do the dimensions of the birds from the two continents present greater differences than are found in the various examples from either.

A.—*S. hirundo ex Europæ.*

Cat. No.	Sex.	Locality.	Wing.	Tail.		Bill.		Tarsus.	Middle toe and claw.
				Outer feather.	Depth of fork.	Length.	Height at base.		
9559	♂	Europe.	10.30*	5.70	2.65	1.38	0.33	0.81	0.97
24280	♀	Holland.	9.80	5.60	2.60	1.51	1.31	0.78	0.90
21680	♂	Hungary.	10.80	6.20	2.70	1.45	0.36	0.80	0.90
23444	♀	"	10.60	5.90	2.70	1.45	0.32	0.84	0.96
23445	♂	"	10.80	6.50	3.00	1.35	0.31	0.80	0.90

B.—*S. hirundo ex Americæ.*

Cat. No.	Sex.	Locality.	Wing.	Tail.		Bill.		Tarsus.	Middle toe and claw.
				Outer feather.	Depth of fork.	Length.	Height at base.		
18224	♂	Labrador.	11.00	6.50	3.10	1.50	0.32	0.84	0.98
22287	♀	Massachus'tts	10.40	5.90	3.02	1.41	0.31	0.78	0.93
1149	♂	Cape May, N.J.	10.60	6.40	2.85	1.36	0.31	0.78	0.93
20811	♀	Hudson's Bay	10.40	5.90	2.85	1.50	0.32	0.78	0.95
12474	♂	Utah.	10.50	6.00	2.50	1.51	0.35	0.80	0.95

* Inches and hundredths.

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For a species so long known, the present has remarkably few synonyms. That of *S. Wilsoni* is the one which has been most firmly established. I quote *S. flaviatilis* with a query on the authority of Temminck. This author, and also Degland, unhesitatingly refer it to the present species, while by some very recent authors* it is regarded as distinct. Eyton, in calling the bird *S. marina*, derives his authority for the specific name from the *Hirundo marina*, of Ray's Synopsis, p. 131. Brisson's *Sterna major* probably also refers to this species, but though both these latter names have priority over Linnæus' appellation, they are to be disregarded, as neither of their authors were binomialists.

STERNA MACROURA Naumann.

Sterna hirundo, Faber, Prod. 1822, p. 88. Fabricius, Faun. Grœn. 1780, p. 105. Nec Linn. nec Richards.

Sterna macroura, Naum., Isis, 1819, p. 1847. Degland, Ornith. Europ. 1849, p. 344. Lawrence, Gen. Rep. Birds, 1858, p. 862.

Sterna arctica, Temm., Man. Orn. 1820, ii., 742, et auct. pleriq.

Sterna nitzschii, Kaup, Isis, 1824, p. 153, secundum Gray.

? *Sterna brachytarsa*, Graba, fide Gray.

DIAG.—*St.* rostro gracile, rubro; pedibus brevissimis, rubris; corpore toto cærulescente-plumbeo, subtus dilutius; caudâ, uropygio, tectricibusque caudalibus inferioribus albis; rectrice laterali valdè elongatâ, pogonio externo griseo-fusco.

Habitat.—Europe. Atlantic Coast of North America from Massachusetts northward. Interior of Arctic America, (Hudson's Bay, Great Slave Lake.) Semi-arctic Straits.

Examination of a very large series of this species shows it to be subject to great variations in some respects. These are especially noticeable in the bill and tail. The largest bill in the series measures 1.40 inches along the culmen; the smallest (from Nova Scotia) only 1.08,—the difference being over .30 of an inch. The average length of bill is about 1.30. The tail varies in length quite as remarkably, the difference between two equally adult individuals being more than 1½ inches. The color of the bill is pretty constant,—a uniform deep lake. Sometimes, however, it acquires a dusky tip, but never the decided black space which exists in *S. hirundo* and *Forsteri*. The bill is much smaller, and every way more delicately shaped than in those species. The under parts are nearly uniform in color. This is very decided, scarcely if at all lighter than the back, (very different from the slight wash of *hirundo*), and extends in full intensity quite from the throat to the vent,—the under tail coverts being pure white, in marked contrast. The under surface of the wings do not share the general color of the body, but are pure white. The feet are exceedingly short, and hardly vary appreciably. Their color is carmine, not so deep as the bill, but still not of the vermilion or coral red of those of *hirundo*.

The distinctive features of this species and the *S. hirundo*, will be found under the head of *S. Forsteri*. They are so many, and so well marked, that it is difficult to conceive how the two species were ever confounded. The differences between it and *S. Pikei*, the next most closely allied species, are given under the head of the latter. There is no other North American species with which the present requires comparison.

I have carefully examined a large series of examples from both continents, and have been unable to detect the slightest discrepancies. This is one of the species of which, so far as I am aware, American and European specimens have never been separated by any writer.

Temminck's name of *arctica* has until recently been very generally applied to this bird; but that of Naumann must supersede it. Temminck admits that Naumann named the bird *macroura* before he called it *arctica*, but insists upon

* Des Murs, Traite Générale d'Oologie Ornithologique, p. 551.

the adoption of his name upon the following grounds: "Le nom de *macroura* ne convient point à ma *St. arctica*; elle a seulement une queue un peu plus longue que *St. hirundo*, tandis que nous avons en Europe et à l'étranger des Sternes à queue très longue, et que *St. Dougalli* a une queue extraordinairement longue, dépassant les ailes souvent de plus de deux pouces." The fact, however, of there existing other Terns with tails as long or longer than the species to which the name *macroura* was applied, would hardly be recognized by ornithologists as a valid excuse for setting aside a prior designation. Temminck's description is very accurate, but the dimensions given, ("13 pouces 6 ou 8 lignes") is considerably below the average.

I regret that I have never seen the immature or winter plumage of this species; the more so, since, so far as I can discover, no description of these stages has been given by any American writer. They were unknown to Temminck. Degland* says that the winter plumage differs from that of summer only in the black of the crown being variegated with white. The same author describes the young before the first moult as resembling those of *S. hirundo*; but being a little smaller, the tarsus notably shorter, the bill slenderer and brown, with the base and cutting edge of the mandibles yellowish red. His description in other points does not differ materially from *S. hirundo*.

Degland also speaks of the occurrence of a hybrid of this species, and the *S. hirundo*, partaking in a varying degree of the characters of either parent. Though I have never met with a specimen which I could not unhesitatingly refer to one or the other species, it seems not at all improbable that hybrids should really occur.

The *Sterna hirundo* of the authors quoted in the synonymy undoubtedly refers to the present species. Though in the description of *S. nitzschi* of Kaup there are some discrepancies, I follow Gray in assigning it as a synonym. I have never had an opportunity of examining *S. brachytarsa* of Graba, but quote it entirely upon the authority of Gray.

STERNA PIKEI, Lawrence.

Sterna Pikei, Lawr. Ann. N. Y. Lyc. N. H., vi. 1853, 3. Id. Gen. Rep. Birds, 1858, 863. Atlas, pl. xcv.

DIAG.—(*Adultus, vestitu hyemali*?) *S.* rostro tenue, fuscесcente-rubro; fronte albo griseoque variegato; occipite nigro; dorso alisque griseo-cœrulescentibus; uropygio albo; caudâ valde elongatâ, forficatâ, rectrice laterali pogonio externo fuscâ; corpore subtus albo; pedibus rubris.

Habitat.—Coast of California.

I have before me the type of *Sterna Pikei*, the original of Mr. Lawrence's descriptions (l. c.) obligingly furnished by that gentleman for examination. This specimen, the only one known to exist in any cabinet, is unfortunately in immature or winter plumage, and in rather poor condition. The species is a very strongly-marked one, differing widely from any other of North America, not only in colors, but in form and proportions. In size it is considerably smaller than *S. macroura*, the wing being one inch or more shorter than in the average of that species; the tarsi and toes a very little less. The bill measures 1.12 inches; it is remarkably slender, its height at base being only .25 of an inch—just about equal to that of *antillarum*. The color is quite undefinable in the specimen before me, but, as remarked by Mr. Lawrence, is probably deep carmine in life. The whitish front, becoming more and more mixed with grayish black towards the occiput, together with the plumbeous lesser wing coverts, are evidently those of an immature bird, probably of its first winter. The black of the occiput is quite pure, and extends on the sides of the head far enough to embrace the eyes. The marking of the primaries and secondaries are precisely those of *S. macroura*, and the color of the back and wings is much the same.

* Ornith. Europ. 1849, ii. p. 345.

The tail is very long. I do not mean, however, that the lateral tail feathers are greatly produced, as in *macroura* and *paradisea*, (though that is not improbably the case in the summer plumage) for the depth of the fork is not greater comparatively, than in *hirundo*; but the whole tail is produced, the central feathers being absolutely as long as in *macroura*, which is a larger bird. The outer web of the lateral tail feather is very dark colored,—even more so than is that of *macroura*,—and the outer webs of the other feathers are shaded with grayish; but in the adult it is probable that the colors will be the same with those of the last-named species. A striking feature of *Pikei* is the pure white of the whole under parts, of the rump, and of the neck behind between the black pileum and the back, there being not the slightest trace of the plumbeous wash, so conspicuous in *macroura*, *hirundo*, etc. The species in this respect agrees with *S. paradisea*, and, like that species, may perhaps, during the breeding season, acquire a rosy tint on the under parts.

I regard this species as intermediate between *S. macroura* and *paradisea*, though most closely allied to the former. In the foregoing remarks the differences between the two have been pointed out. With the latter—*S. paradisea*—it agrees in several particulars: slenderness of bill, color of under parts and of feet, &c. It is at once to be distinguished by its much darker colored upper parts, different markings of primaries, pure white rump, slenderer and smaller bill and feet, greater elongation of central tail feathers, &c.

The acquisition of perfect specimens of various stages of this interesting Tern, of whose changes of plumage we can only judge by analogy, and with whose habits we are entirely unacquainted, is a particular desideratum in North American Ornithology.

STERNA PARADISEA Brünn.

Sterna paradisea, Brünnich, Orn. Bor. 1764, p. 46, and of recent authors. Lawrence, Gen. Rep. 1858, 863.

Sterna Dougalli, Montagu, Orn. Dict. Suppl. 1813, and of most authors, including Audubon and Nuttall.

Sterna Macdougalli, Macgillivray, Man. Orn. ii. p. 233.

Thalassæa Dougalli, Kaup.

Hydrocecropis Dougalli, Boie, Isis, 1844, p. 179.

DIAG.—(nupt. temp. ad.) S. rostro tenue, nigro, basin versus rubescente, pedibus rubro-aurantiis; caudâ longissimâ, valdè forficatâ, fere albidâ, remigibus omnibus internè albo-marginatis ad apices ipsas; corpore suprà perlaceo, subtus rosaceo-albo.

Habitat.—Atlantic coasts of Europe and America.

In a number of equally adult examples, I find that the color of the bill varies; in most the black extends nearly or quite to the base, in others fully the basal third of the bill is reddish. The extreme points of both mandibles are yellowish. The color of the mantle is lighter than that of any other species; the tail, exceedingly long and tapering, is of so light a pearly blue as to be almost white. A most striking feature of coloration of this species consists in the well-defined, broad white inner margins of all the primaries extending quite around the tips of the feathers, on to the outer webs on the first and second primaries. Immature and winter specimens have the bill brownish black; the front white; the crown and nape dull black, variegated with white. The lateral tail feathers want the great elongation and attenuation they acquire during the breeding season, the tail being no more deeply forked than that of *Forsteri*, or even of *hirundo*.

This species is so distinct in characters, that a comparison with any other is needless.

The American bird has never, I believe, been separated from the European. The specimens I have compared appear identical in every respect.

1862.]

STERNA ANTILLARUM Coues ex Lesson.

Sterna minuta, Wilson, 1813; Bonaparte, 1828; Audubon, 1838; sed non Linnaei, 1776.

Sterna argentea, Nuttall, Man. Orn. 1834, ii. 280; sed non Princip. Maxim. quæ species Braziliensis.

Sterna frenata, Gambel, Pr. A. N. S. Ph. 1848, iv. 128.

Sternula antillarum, Lesson, Descriptions de Mammifères et d'oiseaux récemment de couverts, &c., Paris, 1847, p. 256. Adultus.

Sternula melanorhyncha, Lesson, op. et loc. cit. Juvenis.

DIAG.—*S. Sternæ minutæ* similis, ejusdemque staturæ; sed rostro brevior et valde graciliore, vittâ frontale angustiore, dorso, uropygio, caudâque suprâ concoloribus, cœrulescentibus-perlaceis.

Habitat.—Atlantic coast of North America, from Labrador to Texas, and ranging further south into the Antilles. Great lakes and rivers of interior of North America. Not on the Pacific coast?

The bill of this species, as usual in the subfamily, varies somewhat in length; but the longest bills before me do not equal the shortest of the European bird. The slenderness of the bill, which is very marked in comparison with its transatlantic congener, is constantly preserved. The black tip of the bill, usually from one and a half to two-tenths of an inch in length, is sometimes reduced to a mere point; but it is very rarely wanting altogether. The white frontal lunula varies within narrow limits, probably widening somewhat with increasing age; but it never, I believe, attains the ordinary breadth of that of the European. The neck behind, between the black pileum and the back, is a somewhat lighter shade than the latter, but the difference is scarcely noticeable. The pearl gray of the back and wings extends unchanged on the rump, upper coverts, and the inner tail feathers quite to their tips; but the outer vanes of the lateral tail feathers, and their bases, are white. As described by most authors, the two outer primaries in the great majority of adult spring birds are black, their shafts white, their inner webs broadly bordered with white, except toward the tips; but specimens frequently occur which have the three or four outer primaries of this color. This is, without doubt, merely a seasonal feature, and one quite independent of sex or age; for all the specimens bearing this character of primaries are adult birds, labelled as having been taken in July and August. At this season of the year they have finished the duties of incubation, and are about to put on the perfect winter dress, as the ragged and dilapidated condition of their plumage testifies. It is well known that allied species of Terns, such as *S. hirundo*, *Forsteri*, etc., towards the close of the summer, at the approach of the moult, entirely lose the delicate silvery hoariness with which the primaries are glossed over during the breeding season—these parts becoming of a plain, dull, brownish tint. The change in the present species is precisely analogous.

The young of the year, taken in July and August, differ greatly from the adults. The bill, though as stout at the base, is much shorter, less acute at the tip, and wants the sharply-defined angle at the symphysis. It is brownish black, the base of the under mandible dusky flesh color. The forehead is mostly white. The crown and occiput are variegated with brownish black and white, the former color mostly aggregated into a postocular patch. The back and wing coverts are lightly washed over with the pearl gray of the adults; but this color is greatly obscured, and its continuity interrupted by dark brown crescentic or hastate spots, one or more on each feather, which give the upper parts a mottled appearance. The primaries are all grayish black, growing successively lighter, and more and more glossed with silvery, from without inwards; the inner webs of all bordered with white. This white is broadest on the outer primary, but falls considerably short of the tip; it grows narrower, but at the same time longer, on the others, until on the inner ones it goes quite around the tip to the

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outer web. The tail is not deeply forked, but simply emarginate, the difference being about that which attains between the adult and young of *Hirundo horreorum*. I have never seen it of quite the shape figured by Audubon; but in his plate it is very accurately colored.

This species is so very distinct from *S. minuta*, that it is a little singular that they should ever have been confounded. The following are the

Differential Diagnoses of the American and European birds.

S. minuta.—Bill along the culmen 1.20 inches, height at base .27; width of frontal lunula .40. Rump, upper tail coverts and tail pure white, in marked contrast to the pearl blue of the back and wings.

S. antillarum.—Bill along culmen 1.05 inches, height at base .25; width of frontal lunula .30. Pearl blue of upper parts continued uninterruptedly on to the rump, tail coverts and tail.

These differences are all I can discover between the two species; quite enough, however, to permanently separate them. Nuttall states that the "Silvery Tern is about $9\frac{1}{2}$ to 10 inches long; the European species 8 to $8\frac{1}{2}$ only." It is difficult to determine the exact length of a species from dried skins; but in this case it is certain that no such difference exists. In fact, judging from the wings and tarsi,—parts which do not change in dimensions in drying,—the two are nearly or quite identical in size; and I am sure that the difference, if any, is not greater than is found between individuals of either species. Both appear to range from eight to nine inches in length. I cannot appreciate the difference in the color of the upper parts mentioned by Nuttall.

But, while our pretty little Tern thus rejoices in unimpeachable claims to specific distinction, it has not been equally fortunate in retaining for any length of time undisputed possession of a title of its own. By the earlier writers on North American Ornithology it was confounded with the European bird, and called *Sterna minuta*, Linn. Nuttall, in 1834, was the first to vindicate its claims to specific distinction from its European analogue. This author, however, while he gives correctly enough its essential characters, commits the grave error of referring it to the Brazilian *S. argentea* of Prince Maximilian,—quite a different bird. Nuttall appears to have made the mistake in this wise. He evidently never examined a specimen of *S. argentea*; for he says, "That our bird is that of Brazil we have no further evidence than the slight notice of Temminck." Now Temminck's* remark is as follows: "Cette espèce,"—*S. minuta*,—"est absolument la même dans l'Amerique septentrionale. Les voyageurs au Brésil ont aussi trouvé dans ces contrées une petite hirondelle-de-mer modelée sur les formes de la nôtre. Mais elle forme une espèce distincte, bien caractérisée par son bec plus robuste, qui est entièrement d'un beau jaune clair; les distributions des couleurs offrent aussi quelques disparités. Le prince de Nieuweid indique cette espèce sous le nom de *Sterna argentea*. Voy. v. i. p. 67." With only this brief indication to guide him, and impressed with the different distribution of the colors of the upper parts of *S. minuta* and *antillarum*, Nuttall might readily overlook the discrepancies mentioned in the size of the bill, and in this manner refer the American bird to the Brazilian.

In the Proceedings of the Philadelphia Academy for 1848, Dr. Gambel points out the distinctive features of the present species and the *S. argentea*, and our bird being thus left without a name, he applies to it the exceedingly appropriate one of *S. frenata*, by which it has been known from that date up to the present time. I am therefore very reluctant to supersede it by any other; but the *Sternula antillarum* of Lesson undoubtedly refers to the present species, and has priority in point of date. Lesson's description (vide op. cit.) is essentially as follows: "Differs from *S. minuta* in its shorter bill, of orange color, tipped with black; the white frontal band narrower. Two outer quills bordered with

* Man. d'Orn. vol. ii. p. 753.

black; tarsi orange. Lives on the banks of the Guadalupe." Here, it will be noticed, that though the characters are so brief, the peculiar features of bill and frontal lunula are given with such precision, that there can be no doubt of the propriety of referring the description to the species now under consideration.

Immediately following the description of the *S. antillarum*, there is instituted (l. c.) a *Sternula melanorhyncha*, Less., with substantially the following characters: "A little stouter than the preceding; differs from it and *S. minuta* in the straight and black bill. The white front of small extent. Black of head above extends to middle of neck. Black of sinciput mixed with white; lower neck white above, the gray of the upper part of the body washed with brownish. Tail short, little forked; the lateral feathers tipped with slender filaments. Tail pale grayish white, the outer quills broadly margined with brown." It is evident from almost every paragraph of this description, more particularly the mention of the black bill, the sinciput mixed with white, and the upper parts washed with brownish, that Lesson had in view an immature or winter Tern. The habitat given is the same as that of the preceding,—*antillarum*,—and I have but little doubt that the description is that of the young bird of the species now under consideration, in which the characters are almost exactly as given by Lesson. Indeed, a specimen before me agrees exactly with the description, even to the lateral tail feathers tipped with slender filaments,—said filaments being the termination of the shaft of the feather, from which the web has been worn away. I therefore quote *Sternula melanorhyncha*, Less., as a synonym of the present species.

Genus HYDROCHELIDON Boie.

Hydrochelidon, Boie, Isis, 1822, p. 563. Type *S. nigra* Linn.

Viralva, Leach, Stephen's Zool. 1826, xiii. p. 166. Same type.

Pelodes, Kaup, Sk. Ent. Eur. Thierw. 1826, 107. Type *Sterna leucopareia*, Natterer.

Ск.—Bill a little shorter than the head, longer than the middle toe and claw; very delicate, slender, acute; culmen and commissure decidedly declinato-convex, the amount of curvature increasing towards the tip; outline of rami and gonys both concave, the former most so: the angle separating them prominent and very acute. Wings exceedingly long, pointed, of same color as back, without distinct markings on either web. Tail rather short, contained $2\frac{1}{2}$ times in the wings, only moderately emarginate, (much as in *Gelochelidon*,) the lateral feathers but little exceeding the next, not tapering and acuminate; all the feathers broad and rounded. Feet slender and short; tarsi much abbreviated, rather less than the middle toe alone. Toes moderately long; the webs rather narrow, and very deeply incised. Size small, general form delicate; colors mostly black, the wings and tail plumbeous.

A genus distinguished from *Sterna* proper chiefly by its very slender attenuated bill, with its decurved tip: its short tail, of a very different shape; its deeply incised interdigital webs and its very peculiar style of coloration. Other differences, however, will be noted in the preceding diagnosis. North America contains but a single representative,—the young of which was described by Wilson as *S. plumbea*, but which is in all probability identical with the well-known European *H. fissipes*. Other closely-allied species of Europe are the *H. nigra*, (of Linnæus—*H. leucoptera* of most authors), and *H. hybrida* (of Pallas—*H. leucopareia* of most authors.)

The principal synonym of *Hydrochelidon* is *Viralva* of Leach, (1826,) based upon the same type. *Pelodes* of Kaup, 1829, founded upon *H. leucopareia*, is also strictly a synonym of *Hydrochelidon*.

HYDROCHELIDON FISSIPES G. R. Gr. ex Linn.

Sterna fissipes, Linn. Syst. Nat. i. 1766, 228. Not of Pallas.

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Hydrochelidon fissipes, G. R. Gray. Gen. Birds, iii. 1849, 660.

Sterna nigra, Brisson, and of authors. Not of Linn.

Hydrochelidon nigra, Boie, Isis, 1822, p. 563.

Viralva nigra, Leach, Steph. Gen. Zool. 1826, xiii. p. 167.

Sterna nævia, Linnæus, S. N. i. 1766, 228. Young.

Sterna plumbea, Wilson, Am. Orn. vii. 1813, 83, pl. lx. Young.

Hydrochelidon plumbea, Lawrence, Gen. Rep. 1858, 864.

Habitat.—Europe. North America generally, both on the sea-coast, and in the interior.

This species in all its changes of plumage is too well known to require any descriptions.

I have critically compared quite a series of European and American specimens, in all stages of plumage, but have been entirely unable to detect the slightest discrepancies between the birds of the two continents. The specimens before me are all absolutely identical in size and relative proportions of different parts; and the colors of those of the same age correspond minutely. There do not appear to exist the slightest characters upon which to base specific distinction.

The first distinctive name applied to the American bird was *plumbea*, of Wilson, based upon the immature bird, he probably, however, not recognizing it as the young, or desiring to separate it from the European species. The birds of the two continents were first formally separated by Bonaparte, in 1838, in his Comparative List, and his example has been followed by the majority of subsequent American authors.

To G. R. Gray, I believe, is due the credit of elucidating the synonymy of this, as well as of the other species of the genus, which was in a state of great confusion. The proper name of the present species appears to be *fissipes*, Linn., the name *nigra*, Linn., usually applied to it, really referring to the white-winged black Tern of Europe, of which *leucoptera* is the most firmly established synonym. Mr. Gray has also shown that the proper name of the whiskered Tern usually given as *leucopareia* Natterer, is *hybrida* of Pallas.

Genus HALIPLANA Wagler.

Onychoprion, Wagler, Isis, 1832, p. 277. Type *S. serrata*, Forster.

Haliplana, Wagler, Isis, 1832, p. 1224. Type *S. fuliginosa*, Gm.

Сн.—Bill as long as the head, but little less than the tarsus and middle toe together, perfectly straight, stout, especially at base, where it is nearly as broad as high, tip rather acute. Culmen but very slightly convex; gonys about straight, so ascending as to make the commissure nearly straight; rami slightly convex, the prominence between them and the gonys illy developed, not acute. Nostrils somewhat more anterior than in *Sterna*, not nearly so much so as in *Anous*, in a decided, but rather irregularly-defined sulcus, which terminates a little beyond the middle of the bill in several longitudinal striæ. Outline of feathers at base of bill much as in *Sterna*. Wings exceedingly long, pointed, but the first primary scarcely surpassing the second. Tail very long, deeply forked, the feathers broader and stiffer than in *Sterna*, not so regularly tapering, but still quite acuminate at their tips. Legs rather long for this subfamily: the length chiefly apparent by a greater denudation of the tibia. Toes rather short; the middle with its claw exceeding the tarsus but slightly. Size moderate; general form slender and graceful. Bicolor.

A genus distinguished from *Sterna* by several important characters. In the shape of the bill, position of nostrils, proportions of primaries, color to some extent, there is an evident approach to *Anous*. It is, however, decidedly to be referred to the typical *Sternæ*, rather than to the *Megalopteræ*.

Wagler's *Onychoprion* is based upon the *S. serrata* of Forster; while his *Haliplana* has as type *S. fuliginosa*, Gm. The former of these species—*S. serrata*—1862.]

is in all probability identical with *fuliginosa*, and is at all events strictly congeneric with it. This being the case, perhaps *Onychoprion* ought to be employed for the genus; as it is instituted several pages in advance of *Haliplana*. But, as the conflicting names are by the same author, and bear the same date, I have preferred to adopt *Haliplana*, which, besides being based upon the old and well-known type *fuliginosa*, has the merit of being much more euphonious.

HALIPLANA FULIGINOSA Wagl. ex Gm.

Sterna fuliginosa, Gml. S. N., 1788, i. 605, et auct.

Haliplana fuliginosa, Wagler, Isis, 1832, p. 1224.

Onychoprion fuliginosa, Gould, Introd. B. aust., 1848, 113.

Sterna serrata, Forster, Descrip. Anim. 1844, 276. Adult.

Onychoprion serrata, Wagler, Isis, 1832, p. 277.

Sterna oahuensis, Bloxham, Voy. Blonde, 1826, p. 251. Fide Cass.

Sterna guttata, Forster, Descrip. Anim. 1844, p. 211. Juv.

Anous l'herminieri, Lesson, Descr. de Mammifères et d'oiseaux, &c., 1847, p. 255. Juv.

DIAG.—H. bicolor, corpore suprâ, rostro, pedibus, remigibusque nigris; corpore subtus, fronte et rectrici laterali nisi apicem versus, albis.—(*Adultus*).

Minor; rostre graciliore; caudâ minus forficatâ; corpore toto brunnescente-nigro, subtus dilutiore, abdomine tectricibusque caudalibus inferioribus griseo-albis; tectricibus alarum latè albo-terminatis.—(*Juvenis*).

The plumage of the young of the year of this species differs so remarkably from that of the adult, that I have above contrasted the diagnoses of the two ages. While the plumage of the adult is well known, a description of that of the young may not be here out of place.

(*Young of the year*.)—The bill is much smaller and weaker than that of the adult; its upper mandible black; its lower, together with the eyes and feet, are dusky red. The whole body is a uniform brownish or fuliginous black,—this color deepening on the primaries, growing lighter on the under parts, until on the abdomen and under tail coverts it is dull grayish white. The wing coverts and scapulars are all broadly tipped with white, giving a very marked spotted appearance to the parts. The feathers of the back, rump and upper tail coverts are narrowly margined with dull rufous, which gives a transversely waved appearance to the parts. The tail is uniformly of much the color of the wings: all the feathers at their extreme tips fading into light brown.

The above description is taken from a bird in the collection of the U. S. Exploring Expedition, under Captain Wilkes, U. S. N., taken at Hendin Island. It is labelled "*S. fuliginosa*, Gm. juv.," by Mr. Cassin. I have carefully compared the series of adults in the same collection, and cannot find that they differ in the least from specimens from the West Indies and Southern States.

Upon the above-described state of plumage of *Haliplana fuliginosa* is based, I take it, the *Anous l'herminieri* of Lesson. ("Descriptions de Mammifères et d'oiseaux récemment découverts," 1847, page 255.) A condensed translation of this author's description is as follows: "Length 24 cent. Bill black above, red on the lower mandible; tarsi red. Plumage uniform dusky black beneath, the lower belly and under tail coverts white, washed with gray; above blackish brown, dark and uniform on the head and neck, enamelled with transverse white spots on the greater wing coverts, and rayed with rufous on the back, rump and wing coverts." It will be seen that this description corresponds in the minutest particulars, which render it but little if at all doubtful, what bird he had under consideration. His specimens came from the Antilles near the Guadalupe.

I have also quoted, as a synonym of the young, *S. guttata* of Forster. This author (loco citato) says: "*S. caudâ forficatâ corpore fuliginoso, dorso tectricibusque albomaculatis, pedibus nigris*,"—and a part of his further description is: "*Corpus magnitudinæ circiter Sternæ hirundinis*." . . . "Corpus

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omne fuliginosum; abdomine circa anum albicante; fronte fusco-cinerea." The dimensions are given as length 14 inches; bill 1.50; tarsus and toes 2.75. This description in all respects applies very exactly to a stage of plumage a little more adult than that characterized as *Anous l'herminieri*, in which the under parts have become lighter, and there are signs of the white front.

Sterna serrata, of the same author (page 276), is to be referred to *S. fuliginosa*, provided the Pacific bird be the same as the Antilles and Florida, which we have no reason to doubt. I quote *S. oahuensis* on the authority of Mr. Cassin, not having an opportunity of consulting the reference.

Section MEGALOPTERÆ.

If the preceding groups which have been considered as genera—and they are so held by the majority of modern writers—be really such, then the *Anous stolidus* is entitled to more than generic separation from the other representatives of the subfamily. The discrepancies in every particular of form, as well as of pattern of coloration, are very marked and decided. In the following diagnosis are given the characters which present themselves in the *Anous stolidus*; my want of familiarity with exotic forms preventing me from distinguishing with accuracy the features of the section from those that are strictly characteristic of its typical genus.

Genus ANOUS Leach.

Anous, Leach, Stephens' Gen. Zool. 1826, 139. Type *S. stolidus*, L.
Megalopterus, Boie, Isis, 1826, 980. Same type.

CH.—Bill greatly exceeding the tarsus, rather longer than the middle toe and claw, as long as the head, moderately robust, depressed at the base, where it is very broad (as broad as high), compressed in the rest of its extent, tapering to the rather acute, attenuated and somewhat decurved tip. Culmen about straight for half its length, regularly decurved towards the tip, rounded, and towards the base very broad and flat. Commissure about straight to near the tip, where it is regularly declinato-convex. Outline of both rami and gonyes concave, former most so; the prominence which separates them being illy defined and not acute. Both mandibles marked with numerous more or less distinct longitudinal striæ; their cutting edges inflected. Nostrils situated far forwards, their anterior extremity nearly half way to the tip of the bill, in a deep sulcus formed by the rounded culmen and a prominent broad ridge which runs from the base of the upper mandible, along its cutting edge to beyond the nostrils, where it gradually becomes lost. Just above the base of this ridge there is a small but distinct triangular fossa, separated by an oblique stria from the large nasal sulcus. Outline of feathers at base of bill very peculiar; those on the culmen have a broadly convex outline, and reach considerably beyond the lateral feathers, which latter slope rapidly backwards with a slightly convex outline. This is the reverse of *Sterna*, in which the feathers reach far forwards on the sides of the upper mandible, and recede on the culmen to form an acute angle. Wings only moderately long for this subfamily, not very acute, the first primary scarcely surpassing the second; all the primaries slightly falcate, very broad almost to their rounded tips; unicolor. Tail exceedingly long, more than half the wing; rounded, the lateral feathers regularly much graduated; all the feathers broad at the base, tapering to their somewhat acuminate tips, their shafts stiffened. Tarsi moderately stout, exceedingly short, much less than the middle toe without the claw. Lateral toes very long, the inner especially, which is but little shorter than the outer. Hind toe well developed. Interdigital membranes very long and full, their margins even, unincised. Size moderate; general form stout; nearly unicolor; colors very dark.

ANOUS STOLIDUS (Linn.)

Passer stultus, Ray, Syn. 154, fide Leach.

1862.]

Gavia fusca, Brisson, Ornith. pl. xviii. fig. 2.

Sterna stolidus, Linn., S. N. 1766, i. 227, et auct. antiq.

Anous stolidus, G. R. Gray, Gen. Birds, 1849, iii. 661, et auct. recent.

Megalopterus stolidus, Keys, et Blas., Wirb. Eur. 1840, 98.

Anous niger, Stephens, Gen. Zool. 1826, xiii. 140.

A comparison of the Floridan bird with that from the South Pacific, collected by Wilkes' Exploring Expedition, shows some differences of color, form and size, which, though not great, are well marked and quite constant in all the specimens I have examined. The bill of the Pacific bird is of the same length as that of the American, but is higher at the base, which gives it a somewhat different shape. The toes are considerably longer, while the tarsus is of just the same length; making a different relative length of tarsus and toes. The wing is from a half to three-fourths of an inch longer; the tail is very decidedly longer, the difference being quite an inch. The central tail feathers are half an inch shorter than the lateral feathers in the Pacific bird; while in the American the emargination is much less, only about a fourth of an inch. The differences in color are slight. The American bird has the occiput bluish plumbeous, which fades into pure white on the crown anteriorly; while the Pacific bird has the occiput darker, and the crown ashy white instead of pure. The sides of the head and neck all round, in the American bird, have a bluish plumbeous wash, notably different from the general fuliginous, which is entirely wanting in the Pacific bird. The feet of the American bird appear much darker in the dried skin.

Mr. Cassin, in the Ornithology of the Expedition, remarks upon these differences in the following words: "Numerous specimens from the shores and islands of the Pacific Ocean present, with some degree of uniformity, small and apparently unimportant differences from others from the Atlantic coast of North America. The bill appears to be larger in the latter, and a slight dissimilarity is observable in the colors. On careful comparison, however, we are not inclined to consider the bird of the Pacific as possessing characters sufficient to justify a distinct specific designation; but venture to suggest that further examination of specimens from localities in the two great oceans, and especially of the various immature plumages, is yet desirable."

I tabulate the differences between the two, leaving it to future investigation to determine their constancy and value.

American Bird.

Length of wing 10·00 to 10·50 inches.
Length of tail about 6·00.
Height of bill at base ·38.
Length of tarsus 1·00.
Length of middle toe and claw 1·45.
Middle toe and claw 1·45 hundredths of tarsus.

Central tail feathers but slightly shorter than the next.

Occiput bluish plumbeous, becoming pure white on the front. Sides of head and neck all round with a decided wash of bluish plumbeous. Feet nearly black in dried skin.

Pacific Bird.

Length of wing 11·00 to 11·25.
Length of tail about 7·00.
Height of bill at base ·43.
Length of tarsus 1·00 (same).
Length of middle toe and claw 1·60.
Middle toe and claw 1·60 hundredths of tarsus.

Central tail feathers ·50 of an inch shorter than next.

Occiput brownish ash, becoming ashy white (not pure) on the front. Sides of head and neck not notably different from general fuliginous. Feet reddish brown in dried skin.

The difference in color appears very slight. I attach more importance to the discrepancies in size and proportions. If the Pacific bird be really distinct from the American, it has probably yet to receive a name; for it is very different from the various species of *Anous* mostly described by Mr. Gould. In that event, it may be called a *ANOUS FRATER*.

In the preceding pages are noticed all the Terns which are known to inhabit

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North America. The fact of the writer's being actively engaged in professional duties at a Military Hospital while committing to paper the results of his investigations, will be a sufficient excuse for any evidences of hasty composition which may be apparent.

Catalogue of the MIOCENE SHELLS of the Atlantic Slope.

BY T. A. CONRAD.

In the Miocene or Upper Tertiary formation of the Atlantic Slope there have been collected about five hundred and eighty species of shells,—two hundred and seventy-two of which are Conchifera and three hundred and nine Gasteropoda. The most northern limit of this formation appears to be in Gloucester County, New Jersey, and it underlies the eastern portions of Delaware, Maryland, Virginia, North and South Carolina. I have included in the Miocene formation that portion of the South Carolina Tertiary referred to the Pliocene period by Tuomey and Holmes, because I can discover no line of demarcation by which these tertiary strata can be divided into two distinct groups. The extinct species common to South Carolina and the more Northern States are numerous, and the fauna can only be regarded as that of one geological era. Some few of the species described by Tuomey and Holmes from the South Carolina Tertiary occur also in New Jersey, at the most northern boundary of the Miocene. The percentage of recent species in South Carolina, it appears to me, should be greatly reduced,—and I would reject from the list as many as eighteen, consisting of the following shells: *Busycon canaliculatum*, *B. perversum*, *Strephona literata*, *Littorina irrorata*, *Natica canrena*, *Dolium galea*, *Fasciolaria gigantea*, *F. distans*, *Pholas costata*, *P. oblongata*, *Petricola pholadiformis*, *Solen ensis*, *Lucina divaricata*, *L. Pennsylvanica*, *Cardium magnum*, *Macra similis*, *Yoldia limatula*, *Strigilla fluxuosa*. It may be that all the species are extinct, but I have not had an opportunity of comparing all those doubtful shells with the recent forms. *Natica heros* and *N. duplicata*, *Say*, have fossil analogues in Maryland so closely resembling them that I find no essential difference; but the shells of this doubtful character are not more than thirty in number out of five hundred and eighty-one species. Near the coast, a Post-Pliocene or Pleistocene formation rests immediately on the Miocene, replete with existing forms, but as a group resembling that of more Southern latitudes on the coast of the United States. There is no intermingling of extinct species between these two formations, and the passage is almost as abrupt as between the Eocene and Miocene.

The final subsidence of the Eocene appears to have been accompanied by such an alteration of climate or other conditions as to have given origin to a totally distinct terrestrial and marine fauna, the latter existing on an Eocene and Cretaceous bed, extending from New Jersey to South Carolina inclusive, and which appears to have been generally extinct and above the sea during the existence of the European Pliocene faunas.

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